

UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICANT: Ruppert et al.
SERIAL NO.: To Be Determined
FILED: Herewith
FOR: LOW FLOOR DRIVE UNIT ASSEMBLY FOR AN
ELECTRICALLY DRIVEN VEHICLE

ATTORNEY DOCKET NO.: 96 AUT 013 (60,130-1004)

Assistant Commissioner of Patents
Washington, D.C. 20231

PRELIMINARY AMENDMENT

Dear Sir:

Please preliminarily amend the above-identified application as follows:

IN THE SPECIFICATION

Please insert the following paragraph at page 1, line 1:

-- This application is a continuation of 08/801,531 file on February 18, 1997.--

Please replace the paragraph starting at page 7, line 20, with the following paragraph:

Another method of mounting the motors for the present invention is disclosed in United States Patent No. 5,924,504 entitled "Suspension Drive Unit Assembly for An Electronically Driven Vehicle." Another mounting of the motor relative to the axle of the wheel hub is disclosed in United States Patent No. 5,878,830 entitled "Space Saving Connection for Electric Drive Motor to Wheel Hub."

A marked up copy of this paragraph is attached as Appendix A.

IN THE CLAIMS

Please cancel claims 1-22 and add the following new claims.

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23. An automotive vehicle drive unit assembly comprising:

first and second driving axle shafts being co-linear and defining a lateral axis of rotation;

first and second wheel hubs driven by said first and second driving axle shafts respectively about said lateral axis of rotation;

a first gear set for driving said first wheel hub;

a second gear set for driving said second wheel hub;

a first electric motor for driving said first gear set and defining a first longitudinal axis of rotation that is transverse to said lateral axis of rotation;

a second electric motor for driving said second gear set and defining a second longitudinal axis of rotation that is transverse to said lateral axis of rotation and spaced apart from said first longitudinal axis of rotation; and

first and second planetary gear sets driven by said first and second gear sets about said lateral axis of rotation.

24. An assembly as set forth in Claim 23 wherein said planetary gear sets are incorporated into said wheel hubs.

25. An assembly as set forth in Claim 23, including a first gearbox for housing said first gear set and a second gearbox for housing said second gear set, said first and second gearboxes being mounted to said first and second electric motors respectively and wherein said first and second planetary gear sets are incorporated into first and second gearboxes.

26. An assembly as set forth in Claim 23, wherein said first gear set includes a first pinion gear in driving engagement with a first ring gear mounted for rotation with said first wheel hub and said second gear set includes a second pinion gear in driving engagement with a second ring gear mounted for rotation with said second wheel hub.

27. An assembly as set forth in Claim 26, wherein said first planetary gear set includes a first sun gear mounted for rotation with said first ring gear and a first plurality of planet gears in meshing engagement with a first planetary ring gear hub and said second planetary gear set includes a second sun gear mounted for rotation with said second ring gear and a second plurality of planet gears in meshing engagement with a second planetary ring gear hub.

28. An assembly as set forth in Claim 27, wherein said first planetary ring gear hub drives said first wheel hub and said second planetary ring gear hub drives said second wheel hub.

29. An assembly as set forth in Claim 27, wherein said first planetary ring gear hub drives said first driving axle shaft and said second planetary ring gear hub drives said second driving axle shaft.

30. An assembly as set forth in Claim 29, wherein said first planetary ring gear hub is integrally formed with said first driving axle shaft as one piece and said second planetary ring gear hub is integrally formed with said second driving axle shaft as one piece.

31. An assembly as set forth in Claim 30, wherein said first gear set and said first planetary gear set are housed within a first common gearbox mounted to said first electric motor and said second gear set and said second planetary gear set are housed within a second common gearbox mounted to said second electric motor.

32. An assembly as set forth in Claim 23, including a third electric motor in parallel driving relationship with said first electric motor to drive said first gear set and a fourth electric motor in parallel driving relationship with said second electric motor to drive said second gear set wherein said first and third electric motors drive said first gear set and said second and fourth electric motors drive said second gear set independently from each other.

33. An assembly as set forth in Claim 32, wherein said first and said third electric motors extend radially from said first gear set, and said second and said fourth electric motors extend radially from said second gear set.

34. An assembly as set forth in Claim 33, wherein said first gear set includes a first pinion gear driven by said first electric motor and a second pinion gear driven by said third electric motor, said first and second pinion gears for simultaneously driving a first ring gear and wherein said second gear set includes a third pinion gear driven by said second electric motor and a fourth pinion gear driven by said fourth electric motor, said third and fourth pinion gears for simultaneously driving a second ring gear.

35. An assembly as set forth in Claim 34, wherein said first gear set is housed within a first gearbox mounted to said first and third electric motors and said second gear set is housed within a second gearbox mounted to said second and fourth electric motors.

36. An assembly as set forth in Claim 23, wherein said first and second longitudinal axes of rotation are perpendicular to said lateral axis of rotation.

37. An assembly as set forth in Claim 23, wherein one of said electric motors is mounted at a 90 degree angle extending generally horizontally and forwardly relative to said lateral axis of rotation and the other of said electric motors is mounted at a 90 degree angle extending generally horizontally and rearwardly relative to said lateral axis of rotation.

38. An assembly as set forth in Claim 23, wherein said first and second electric motors are supported by a common axle housing extending along said lateral axis of rotation.

39. An assembly as set forth in Claim 23, wherein said first and second motors are mounted at a 90 degree angle extending generally vertically and upwardly from said lateral axis of rotation.

40. An assembly as set forth in Claim 23, wherein said first and second motors are mounted at an angle extending generally horizontally and rearwardly from said lateral axis of rotation.

41. An automotive vehicle drive unit assembly comprising:
- first and second driving axle shafts being co-linear and defining a lateral axis of rotation;
 - first and second wheel hubs driven by said first and second driving axle shafts respectively about said lateral axis of rotation;
 - a first gear set for driving said first wheel hub;
 - a second gear set for driving said second wheel hub;
 - a first electric motor for driving said first gear set and defining a first longitudinal axis of rotation that is transverse to said lateral axis of rotation;
 - a second electric motor for driving said second gear set and defining a second longitudinal axis of rotation that is transverse to said lateral axis of rotation and spaced apart from said first longitudinal axis of rotation;
 - a third electric motor in parallel driving relationship with said first electric motor to drive said first gear set; and
 - a fourth electric motor in parallel driving relationship with said second electric motor to drive said second gear set wherein said first and third electric motors drive said first gear set and said second and fourth electric motors drive said second gear set independently from each other.

42. An assembly as set forth in Claim 23, including first and second planetary gear sets driven by said first and second gear sets about said lateral axis of rotation.

43. An assembly as set forth in Claim 42, wherein said first gear set is housed within a first gearbox mounted to said first and third electric motors and said second gear set is housed within a second gearbox mounted to said second and fourth electric motors.

44. An assembly as set forth in Claim 43, wherein said first gear set includes a first pinion gear in driving engagement with a first ring gear mounted for rotation with said first wheel hub and said second gear set includes a second pinion gear in driving engagement with a second ring gear mounted for rotation with said second wheel hub.

45. An assembly as set forth in Claim 44, wherein said first planetary gear set includes a first sun gear mounted for rotation with said first ring gear and a first plurality of planet gears in meshing engagement with a first planetary ring gear hub and said second planetary gear set includes a second sun gear mounted for rotation with said second ring gear and a second plurality of planet gears in meshing engagement with a second planetary ring gear hub.

46. An assembly as set forth in Claim 41 wherein said third electric motor defines a third longitudinal axis of rotation that is co-linear with said first longitudinal axis of rotation and said fourth electric motor defines a fourth axis of rotation that is co-linear with said second longitudinal axis of rotation.

47. An automotive vehicle drive unit assembly comprising:

a first driving axle shaft;

a second driving axle shaft, said first and second driving axle shafts being co-linear and defining an axis of rotation;

a first wheel hub driven by said first driving axle shaft;

a second wheel hub driven by said second driving axle shaft, said first and second wheel hubs driven about said axis of rotation, said first and second wheel hubs each including a common outer periphery about said axis of rotation;

a first gear set for driving said first wheel hub;

a second gear set for driving said second wheel hub; and

a pair of electric motors including a single first electric motor mounted at a non-parallel angle relative to said axis of rotation of said first driving axle shaft for driving said first gear set and a single second electric motor mounted at a non-parallel angle relative to said axis of rotation of said second driving axle shaft for driving said second gear set independently from said first electric motor wherein one of said pair of electric motors is mounted at a 90 degree angle extending generally horizontally and forwardly relative to said axis of said first wheel hub and the other of said pair of electric motors is mounted at a 90 degree angle extending generally horizontally and rearwardly relative to said axis of said second wheel hub, said first and second electric motors being mounted at least partially within said common outer periphery.

48. A vehicle comprising:

a vehicle body extending between lateral sides, passenger seats being mounted adjacent each of said lateral sides, a floor defined beneath said passenger seats, an aisle defined between said passenger seats, and said floor also extending beneath said aisle;

at least one driving axle for driving a pair of laterally spaced wheels including a first drive axle shaft associated with the first of said wheels, and a second drive axle shaft associated with the second of said wheels, said first and second drive axle shafts defining an axis of rotation;

a first and second gear set for driving said first and second wheels;

a first electric motor mounted at a non-parallel angle relative to said axis of rotation of said first drive axle shaft for driving said first gear set, and a second electric motor mounted at a non-parallel angle relative to said axis of rotation of said second drive axle shaft and operatively connected to drive said second gear set; and

said electric motors being mounted adjacent to said wheels at a vertical position which is higher than a vertical position of the floor of said aisle.

49. A vehicle as set forth in Claim 48, including a third electric motor mounted in parallel driving relationship with said first electric motor to assist in driving said first gear set and a fourth electric motor mounted in parallel driving relationship with said second electric motor to assist in driving said second gear set.

50. A vehicle as set forth in Claim 49, including a first planetary gear set driven by said first and third electric motors via said first gear set for speed reduction at said first wheel and a second planetary gear set driven by said second and fourth electric motors via said second gear set for speed reduction at said second wheel.

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REMARKS

In order to sustain an obviousness rejection, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. In re Vaeck, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

It has been argued that United States Patent No. 4,270,622 to *Travis* be combined with United States Patent No. 3,933,217 to *Eichinger* to show wheel hubs being driven by a bevel gearset and electric motor in combination with a planetary gearset. It would be improper to modify *Travis* by the teachings of *Eichinger*. *Travis* already has a plurality of bevel gears spaced along the length of the axle that provide gear reduction and would not require further planetary reduction. Further, there is no true suggestion to combine the *Travis* and *Eichinger* patents, and only the disclosure of the combination in applicant's application would suggest this combination. Applicant respectfully requests an indication of where in these references the suggestion or motivation for combination can be found.

Finally, even if these references were to be combined they do not teach the invention as set forth by Applicant in Claim 23. The *Eichinger* patent discloses a motor output shaft 11 that directly drives a sun gear 14 which in turn drives a wheel hub 6 where the shaft 11, sun gear 14, and hub 6 all rotate about a common axis.

Claim 48 requires a motor to be mounted at a vertical position higher than a vertical position of a floor. It has been argued that United States Patent No. 2,093,859 to *Austin* be combined with United States Patent No. 2,589,863 to *Quartullo*. The *Austin* reference discloses a

seating arrangement that teaches the raising of the vehicle floor over the driveline components. As noted at column 1, lines 24-30, the *Austin* reference proposed to “construct a vehicle in which passenger carrying decks are provided along each side wall on a plane above the wheel housing, with readily accessible and tightly closed baggage compartments beneath the passenger compartment and between the wheel housings.” Another benefit of the raised passenger compartment is that the passengers feel safer and more secure because in the event of a collision the impact is typically below and out of line with the passenger compartment, col. 1, lines 35-41. The engine and transmission in *Austin* are positioned at the rear of the bus behind the passenger seats to minimize interference with the baggage compartments.

The *Quartullo* reference discloses a delivery vehicle that has a flat floor area for storing cargo. An electric motor 18 drives a worm gear set 48, 50 to drive the wheel. The motor 18 and gear set 48, 50 are mounted adjacent to the wheel and are positioned within an envelope that does not extend above the wheel. If *Austin* is modified by the motor mounting shown in *Quartullo*, i.e. the motors do not extend above the wheel, the motors would not be at a vertically higher position than the floor, see Figures 1 and 4 of *Austin*.

Even assuming that *Quartullo* teaches the mounting of motors at a vertically higher position than the floor, to modify *Austin* in such a manner would destroy the benefits of *Austin*. The sole purpose of *Austin* was to provide an elevated passenger compartment with baggage storage underneath. *Austin* teaches placing powertrain of the bus at the rear of the vehicle behind the passenger seats to increase the baggage area below the seats. To modify *Austin* by removing the rear powertrain and mounting electric drive systems at each wheel would directly interfere with and decrease the baggage area. Thus, it is improper to modify *Austin* as taught by *Quartullo*.

Claims 23-49 are in condition for allowance. An early indication of such is earnestly solicited.

Respectfully Submitted,



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Dated: February 12, 2001

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APPENDIX A

Version with markings to show changes made

Page 7, paragraph beginning at line 20:


Another method of mounting the motors for the present invention is disclosed in [co-pending patent application number _____] United States Patent No. 5,924,504 entitled "Suspension Drive Unit Assembly for An Electronically Driven Vehicle." Another mounting of the motor relative to the axle of the wheel hub is disclosed in [co-pending patent application number _____] United States Patent No. 5,878,830 entitled "Space Saving Connection for Electric Drive Motor to Wheel Hub."

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CERTIFICATE OF MAILING

I hereby certify that the attached Amendment is being deposited with the United States Postal Service as "Express Mail - Post Office to Addressee", in an envelope addressed to Assistant Commissioner of Patents, Washington, D.C. 20231, on this 12 day of February, 2001.



Laura Combs

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